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Збірка містить праці Міжнародної науково-практичної конференції з інформаційних технологій, систем та засобів штучного інтелекту, обчислювальних машин, систем, мереж та їх компонентів, автоматизації систем та процесів керування, систем захисту інформації, кібернетики, управління проектами, електротехніки та телекомунікацій, інтелектуальних приладів та систем.

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<i>Svitlana Kuznichenko, Iryna Buchynska, Ludmila Kovalenko, Tetiana Tereshchenko</i> Integrated Information System for Regional Flood Monitoring Using Internet of Things	105
<i>V.I. Kyrychenko, V.E. Volkov</i> Problems of Automation of the Workflow Process in the Higher Education Institutions	110
<i>Андрій Левченко</i> Інформаційна Технологія З Перетворенням Різномірних Даних Для Прогнозування Стану Технічних Систем	113
<i>Володимир Лужецький</i> Високонадійні Математичні Фібоначчі-Процесори	118
<i>Alexander Makarenko</i> Toward the Methodology for Considering Mentality Properties in eGovernment Problems	123
<i>Igor Mazurok, Valerii Penko, Yevhen Leonchuk</i> Reliable High Bandwidth Decentralized Live Streaming	129
<i>Тетяна Меленчук, Наталія Арцибашева, Олександр Ілько</i> Підвищення Ефективності Роботи Транспортних Підприємств За Рахунок Використання Інноваційних Інформаційних Технологій В Логістиці	132
<i>Roman Melnyk, Ruslan Tushnytskyu</i> Compression and Multilevel Segmentation for Face Images by Piecewise Linear Approximation	135
<i>Piotr Milczarski, Artur Hłobaż, Paweł Maślanka, Bartosz Zieliński, Zofia Stawska, Krzysztof Podlaski, Piotr Kosiński</i> Carbon Footprint Calculation and Optimization Approach for CFOOD Project	139
<i>Александр Милов, Сергей Евсеев</i> Имитационное Моделирование Распределения Инвестиций В Системах Кибербезопасности	144
<i>Катерина Молодецька, Юрій Тимонін</i> Підхід до Моделювання Інформаційних Операцій в Соціальних Інтернет-Сервісах.....	146
<i>Ольга Мунтян, Максим Мунтян, Анатолій Яровенко</i> Інтелектуальна Система Підтримки Прийняття Лікарського Рішення	149
<i>Любомир Петришин, Віолета Цесьлік, Володимир Глущенко, Марина Костяк</i> Техніка Процесного Аналізу Розподілених Систем Управління	151
<i>Любомир Петришин, Віолета Цесьлік, Михайло Петришин</i> Візуалізаційне Моделювання Процесів в Розподілених Системах Управління	155

Problems of Automation of the Workflow Process in the Higher Education Institutions

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Abstract—Problems connected with the automation of the document flow in higher education institutions are investigated. There are no automated control systems aimed to optimal control of the document flow today. The document flow is studied as specific technological process and special information technology. Proper analysis of the documentation flow of orders for the expulsion of students is done as an example. It is proved that full automation is impossible. It is proved also that control of the document circulation and the documentation flow must be not only technological (by signals), but also organizational (by directives), and the problem of optimization for the control of the document flow must be solved simultaneously with the problem of the control and not after it (as usual).

Keywords—document flow, higher education institutions, control, automated control systems, optimal control, information technology

I. INTRODUCTION

Document flow is an activity on the conduct of the movement of documents at the enterprise (office, institution). For every single document such movement takes place from the moment of document's creation or the moment of its receipt from the other organization to the moment, when appropriate actions are completed: sending the document to other organizations and/or sending it to the archive.

There are lots of problems connected with the document flow in higher education institutions. These problems can be divided into three main groups:

- receipt of documents by executors (performers) after the required terms, which makes it impossible to carry out the necessary actions on time;
- contradictions between different documents, which lead to impossibility of immediate execution of necessary actions and prolong the document processing;
- duplication of documents, which also leads to increasing the time for the document processing.

All these problems are typical for the document flow in any large organization or big enterprise (not only in a college, an academy or a university).

One of the ways to solve problems of the document flow is to automate this process. Automation of the document flow and its optimal control is the main problem to which the present study is dedicated.

II. THE MAIN CONTENT

There are automated control systems (ACS) aimed to control document flow [1], but these systems do not meet present-day requirements of the higher education institutions in Ukraine.

Improvement of ACS for the document management requires not only the implantation of modern information technologies and computer facilities. It is necessary to improve or to change completely organizational, mathematical, information and software support of the ACS [2]. It should be noted also that the problem of optimal control of the document flow has never been considered.

Effective automated control of the document flow needs adequate model of this process. In turn, modeling of the document flow requires to analyze carefully the document flow as a control object. Such analysis is one of the main aims of this study.

Analyzing the document flow as a control object it is possible to consider:

- single document (order, directive, etc.);
- directly the flow of documentation (it is called also the workflow);
- technological documental process as a whole.

Firstly let us consider flow of documentation as a control object.

There are:

- input documentation flows;
- internal documentation flows;
- output documentation flows.

Let us consider as an example the documentation flow of orders for the expulsion of students. To prepare these orders it is necessary:

- to collect all examination results or test results and to analyze these data from the point of view of operating procedures, internal instructions and national laws central legislations), and then to form lists of students for expulsion;
- to make projects of orders, to coordinate orders with various managers and structures;
- to issue already agreed orders;
- to send out orders to the appropriate executors.

Every operation looks rather simple, but combining of different operations leads to the mentioned above difficulties. It is typical for most of the different documentation flows in a higher education institution (not only for the documentation flow of orders for the expulsion of students).

It is also clear that errors in processing of the documentation flow of orders for the expulsion of students can be rather significant, since they affect the fate of people. Some of these errors can be defined as critical errors. Such (critical) mistakes must be avoided at all costs. That is one of the reasons, why the process can't be automated fully (that means that participation of human beings in the mentioned above process is absolutely necessary).

Proper analysis of the documentation flow of orders for the expulsion of students as technological process makes it possible to highlight control parameters and managed parameters. Orders for the expulsion of students are typical one (precisely for universities, colleges and faculties). So mentioned above analysis can be extended to other types of orders in higher education institutions.

The control objective is to minimize the time for movement of orders from initiators to executors, but without increase in the number of critical errors. So the problem of the optimal control of the document flow is inextricably linked with the problem of control (regulation) of the document flow. But optimization must be achieved without losses in reliability, i.e. without increasing of number of errors and with preventing of critical errors.

Achieving of this objective requires not only technological actions and technical novation's (using modern computers and devices, Internet or intranet technologies and cloud computing), but also making organizational arrangements.

So control of the document flow and the documentation circulation is not only the problem of technological (technical) control, but it is closely linked with problems of the organizational management. This is exactly the case when one can speak not about purely technological control, but about organizational and technological control (management). Furthermore, it is very difficult (and sometimes impossible or meaningless) to conduct technological control of the document flow without preliminary organizational decisions or activities.

Technological control is carried out by signals, while organizational control (management) is carried out by

directives and orders. By the way such organizational control also must be optimized.

It is also obvious that control systems aimed to control document circulations or documentation flows in higher education institutions (and in other big organizations) can be only automated systems, but can never be automatic systems. Full automation of the document flows control is impossibility. The reason of that is connected with strong influence of human factor on the process of the document circulation.

The process of the document flow itself can be considered as a special information technology (technology of accumulation, processing, storage and transmission of information). A characteristic feature (even attributive feature) of the implementation of any information technology (especially in the transmission of information, i.e. communication, and in the processing of information) is the presence of a creative element. This creative element is always connected with people who have "only" to adopt this technology. So the document flow processing needs creativity coupled with precision and execution of rules. It can be named "robust bureaucracy".

III. CONCLUSIONS

The following conclusions can therefore be drawn from the foregoing.

– There are no automated control systems aimed to optimal control of the document circulation, because the problem of optimization for the document circulation has never been considered (surprisingly!). There are ACS for control of the document circulation, but these systems are not effective enough, because they are obsolete (at least morally) and they are aimed to carry out only technological (technical) control without improving or changing organizational management.

– Problems connected with the document flow in higher education institutions are similar to such problems in any big office or organization. But ways of solving these problems in a higher education institution are more or less specific, because they are connected with the features of educational process. The main purpose of automation in this case is not to increase the incomes of the higher education institution (although it also has a role to play), but to improve the quality of educational process and, as a result, to raise the level of education

– Effective control of the document flow needs adequate model of this process. By the way mathematical model of the document circulation must be rather simple (because connections between input parameters and output parameters are not complicated for such processes).

– The objective of control of the document circulations is to minimize the time for movement of documents from their initiators to direct executors. But such a reduction in time cannot be achieved by increasing of the number of errors.

– Control of the document circulation and the documentation flow must be not only technological, but also

organizational. Organizational control (organizational management) almost always precedes technological one, but they are closely related. Appearance and implementation of technical innovations and new classes of hardware and (especially) software very often lead to the necessity of organizational changes.

– The process of the document flow (either in higher education institutions or in other organizations) cannot be automated fully.

– The process of document circulation can be considered and studied as a special information technology. Therefore, all the laws of information technology are also valid for the document circulation. Since the implementation of information technology is impossible without the essential participation of a human being, then, as indicated above, a document circulation cannot be automated fully.

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